

Cardinal Directions

By Rafael Lozano-Hemmer



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This short section must be read for proper operation

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General important information

Cardinal Directions (2010)

By Rafael Lozano-Hemmer

Technique

Monitor, stepper motor, iPod touch, motion sensors, custom electronics, stainless steel stand.

Dimensions

The piece has a footprint of 12 inch by 12 inch and is 45 inches high.

Electrical details

The piece needs 100W peak consumption, 20W average, 110 to 240V.

Edition

Edition of 6 + 1 AP

Description

A surveillance monitor shows an extract of Vicente Huidrobo's poem "Altazor" (1919-1931). Referring to the geography of his native Chile, Huidobro wrote "The four cardinal directions are three: North and South". When a presence is detected by infrared sensors, the monitor starts to rotate. As the poem is "geolocated" it always aligns itself to the cardinal points, and the public must walk around the piece in order to read it, like a kind of periscope.

Operation

1. Take the piece out of the crate. The iPod is stored separately in the crate. Find it and connect it to the iPod cable under the motor unit. Also make sure none of the colored cables inside the motor unit are in the way of the rotating parts. Simply rotate the monitor by hand a few turns and take a close look at the piece's mechanical parts.

2. Connect the piece to electrical power via an extension cable. Cardinal Directions comes with a 3-prong power plug (NEMA 5-15) (see image). You will need to use an adapter to connect this plug to a non-American extension cable.



You may connect the piece to 100-120V 60Hz (American) or to 210-240V 50Hz (European) current, as all the gear inside has auto switching power supplies.

3. To turn the piece ON, plug the above mentioned power plug in to the wall outlet. The iPod will prompt you with a button that says "Tap to Unlock". After tapping this button, next tap the Cardinal icon in the iPod's dock.



It is also possible to start the software by holding the home button until the screen with the "Tap to Unlock" screen is gone and the home screen is shown. Then release the home button and again press and hold it until the software starts.

4. To turn the piece OFF, unplug the power plug from the wall. After one minute the iPod software will exit. After another 5 minutes the iPod screen will go black and the iPod enters the hibernation mode.

Cleaning and Maintenance

Please do not clean the iPod's touch screen surface with Windex or soap. Use a lint-free cloth and screen liquid cleaner, such as Kensington Screen Guardian found in computer stores.

For the metal base use normal soapy water or spray on cleaners to clean the metal.

On a regular basis check that all the metal screws and nuts which hold the motor, metal plates and other elements in place are tight.

Placement Instructions

Make sure the metal base is level. Adjust the length of all four feet by loosening the set-screws and sliding the inner cylinder in or out.

The piece can be placed facing any direction. The software will later be used to set the north cardinal direction.

The piece should not be closer than 2 meters from any wall as this will hinder people from walking around the piece.

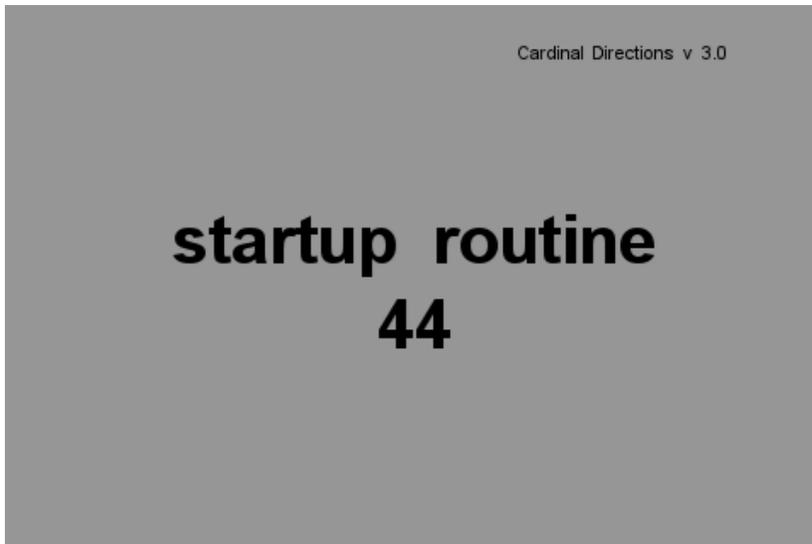
Because the piece uses infrared motion sensors, any human size heat source will trigger its rotation. If such behavior is noticed, check to see if a large sunny window, heater, fireplace etc. is in a 5 meter range of the piece. Try moving the piece further away from those elements.

Use a cable channel or tape to secure the power cable running from the piece to the wall plug.

Note

Do not update the iPod's operating system. This could cause the piece to stop functioning.

Software version 3.0 running on iPod touch



startup routine:
the motor/ monitor rotate to the
zero position



interaction mode:
the movements of the
participants activate the piece
and it starts rotating for 10
seconds.

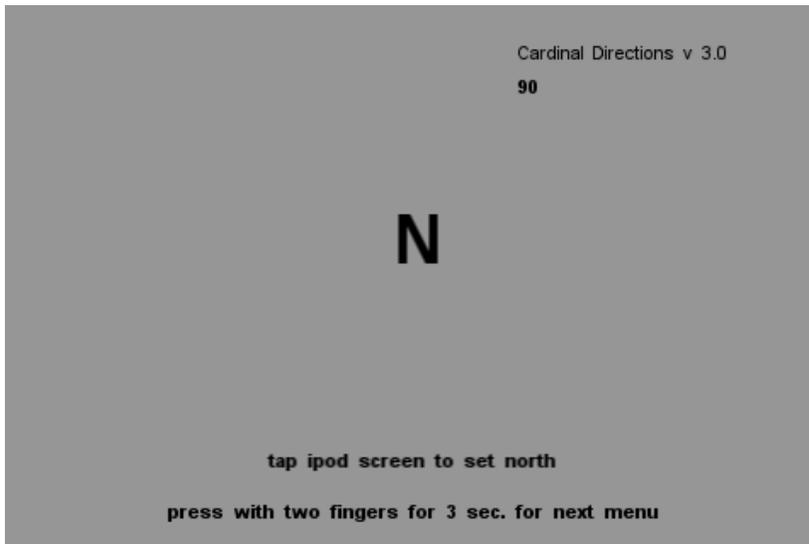
The piece includes custom-made software that runs on an iPod touch placed underneath the motor unit. There are some software options that may be useful if you would like to optimize the performance of the system. To change settings in the software, place two fingertips side by side on the iPod's screen until you see the first settings panel appear as shown in the image below. Leave your two fingers on the screen for about 3 seconds.



language settings:
english, spanish

1. language — Once the new settings panel appears, remove your fingers from the screen. At this point the monitor should quickly rotate to the zero position. Now tap the screen with one finger to change the language in which you would like the main poem will be displayed.

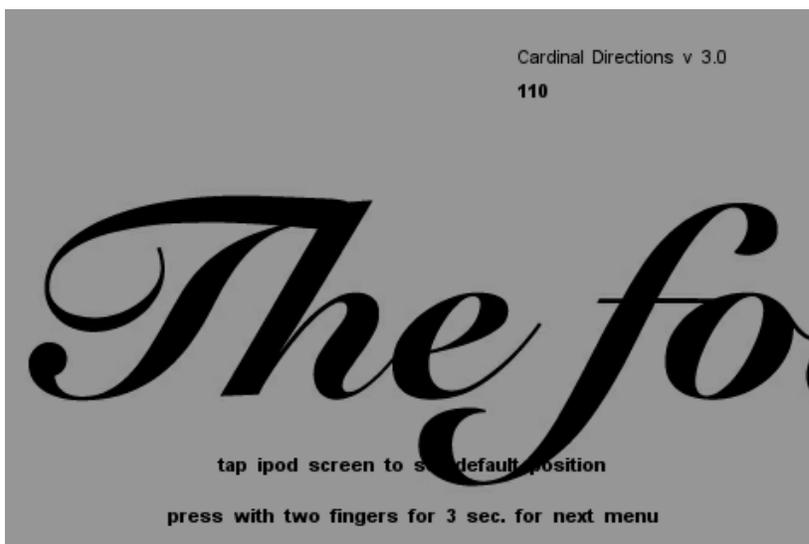
To switch to the next settings panel, place two fingers on the screen again for at least 3 seconds.



north settings:
align the piece to the true north

2. north — As you can see during the normal interaction mode, there is a line with letters S, SW, W, NW, N, NE, E, SE at the top of the screen. When highlighted these letters indicate the cardinal direction that should currently be faced by the monitor. This panel is where you can set the true north for your location. Tap the screen to rotate the monitor step by step (10° steps) until it faces the direction you know to be north.

To switch to the next settings panel, place two fingers on the screen again for at least 3 seconds.



default position:
align the piece to its resting
position

3. default position — If no one interacts with the piece for 10 seconds it will first stop rotating. After an additional 10 seconds it will rotate to its default resting position and the screen will go dark. This feature allows the piece to face the direction of people entering the exhibition space. The text is aligned such that people will see the beginning of the poem in this position.

4. quit – There are two ways to stop the piece. The easiest and recommended one is to pull the main power plug. This will shut off the power to the monitor, motor and electronics. The iPod will go in to hibernation mode after about 6 min.

You can also just press the iPod's home button, while the piece is running. This will quit the software and take you to the iPod's home screen.

To turn the piece back ON plug the main power plug back in to the wall outlet. The iPod will prompt with a button that says "Tap to Unlock". After tapping this button, tap the Cardinal icon in the iPod's dock.



Detailed technical information

Components of the piece

Metal Stand

The stand is made of stainless steel, 31cm x 31cm base, 145cm high

Monitor

The piece uses a surveillance TV with a satin black plastic housing.

iPod touch

The piece uses a jail broken, 2nd generation, 8.0 GB iPod touch, running the 3.1.3 firmware. The iPod communicates with the micro-controller over its serial port.

Motion Sensors

The piece uses eight motion sensors which are pointed towards the eight cardinal directions (N, NE, E, SE, S, SW, W, NW)

Motor + Gears

The piece uses a stepper motor with controller boards and two metal gears with a 48:10 ratio. All these components are combined in a setup we call spinmaster.

Custom-made Electronics

An Arduino Nano micro-controller with an Atmel ATmega328 chip is running custom firmware.

Troubleshooting

if:

- you tap the Cardinal icon and the software opens and closes right away

then:

Hold the iPod's home + power button for about 5 seconds.

A new panel will appear and ask you to "tap/slider to power off".

Do that.

For a short time you will see a black screen with a white spinning icon.

Once that is gone, restart the iPod by pressing the top power button.

If the iPod gets stuck at the screen with the spinning icon, keep holding the

power and home button for about 15 seconds until the iPod goes dark.

Restart the iPod by pressing the top power button.



if:

- the piece is not reacting to people's presence

- no words appear on the screen

- the motor rotates continuously fast, does not stop, especially after the startup routine

- the motor stutters back and forth, especially after the startup routine

then:

After having plugged the piece to the main power, please wait a couple of minutes. The piece might catch itself and start to operate normally.

If the problem persists, press the iPod's home button to quit the software. Now press the Cardinal icon in the iPod's dock to restart the piece.

If the problem still persists, unplug the main power. Also press the iPod's home button if the software is still running.

Now re-plug the main power and start the software.

if:

- the piece reacts correctly to people's presence but the text is not visible on the monitor

then:

Go to page 7 of the monitor's manual.

If the monitor is power properly *power indicator #2* should be illuminated.

Press *power switch #1* to see if that turns the *power indicator #2* and monitor back on.

Try adjusting the brightness *#4* and/or contrast *#3*.

Press buttons *#6*, *#7* and/or *#8* to select the right video input channel.

if:

-the text is only visible on the iPod's screen

then:

This means the iPod has lost the setting that forces it to output it's video signal to the monitor.

To check this settings:



Navigate to the iPod's setting panel.

Scroll down until you see the TV Out option. Tap it.

You should see the panel below.



Ensure that *Enable TV Out* and *Force TV Out* are ON.

You should not need to change any of the other numbers. They are displayed here just for referencing reasons.

We are currently using the TV Out Plugin v1.70 by c00ni, based on TVOut by ashikase.

if:

- you tap the Cardinal icon and the software gets stuck at the loading..... screen

then:

Hold the iPod's home + power button until the iPod shuts off.

A new panel will appear and ask you to "tap/slider to power off".

Keep holding the two buttons until the screen is black.

Restart the iPod by pressing the top power button.

Navigate to the TVOut settings panel. (see above)

Turn TVOut off by sliding "Enable TV Out" and "Force TV Out" to their off positions.

Start the Cardinal Directions software.

Now you should see the piece perform correctly but the text will only be seen on the iPod's screen.

Now quit the software, navigate back to the TV Out settings and turn it back on.

Close the settings panel and restart the Cardinal Directions software.

Appendix I

List of components

iPod touch, Apple, A1288, 8GB memory, firmware 3.0, 3.1.2, 3.1.3 (june 1st 2010)

custom stainless steel stand (12"x12"base, 2" feed of ground, 39.5" rectangular pole, 162mmx92mm top plate)

TV, 5.5 inch CRT, satin black car rear view monitor

Stepper controller, Trinamic, TMCM-110-42 with RS485,

Stepper motor, Soyo, SY42STH38-1206B, 4V 1.2A 36oz-in Unipolar Stepper Motor (double shaft)

Rotary Encoder, CUI Inc, AMT103-V, 500 lines ppr

Rotary Encoder cable, CUI Inc, CUI-435-1FT

Timing Pyllies, martinsprocket, 48 teeth, 10 teeth 10XL037

Timing Belt

custom hollow shaft

Slip ring, MOOG, AC-6023-6

Power supply, 24 DC, 6.25amp, 120-240V auto switching, DT150PW240C

Power cable DC extension, Tensility International Corp, CA-2216

Arduino nano atmega 328

8 x Motion sensors, zilog, ePIR Zdots SBC

Dc power converter, dimension engineering, DE-SW033 (3.3V), DE-SW050 (5V), DE-SWADJ (12V)

RS485 transceiver, Texas Instruments, SN75176BP

8-DIP chips socket

PC Board, Vector Electronics, 8016, 2-SIDE PPH 6.0X9.0

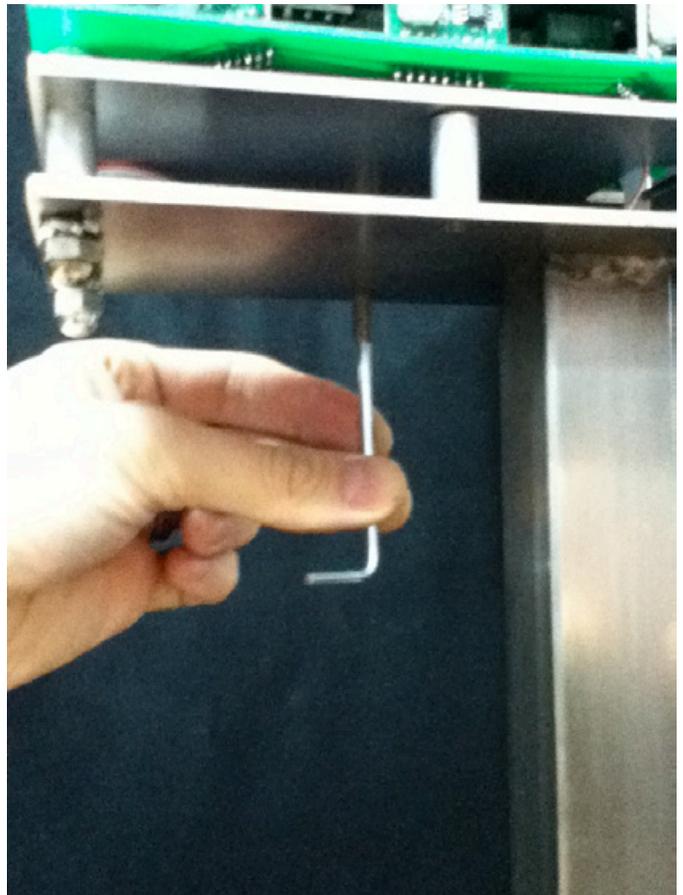
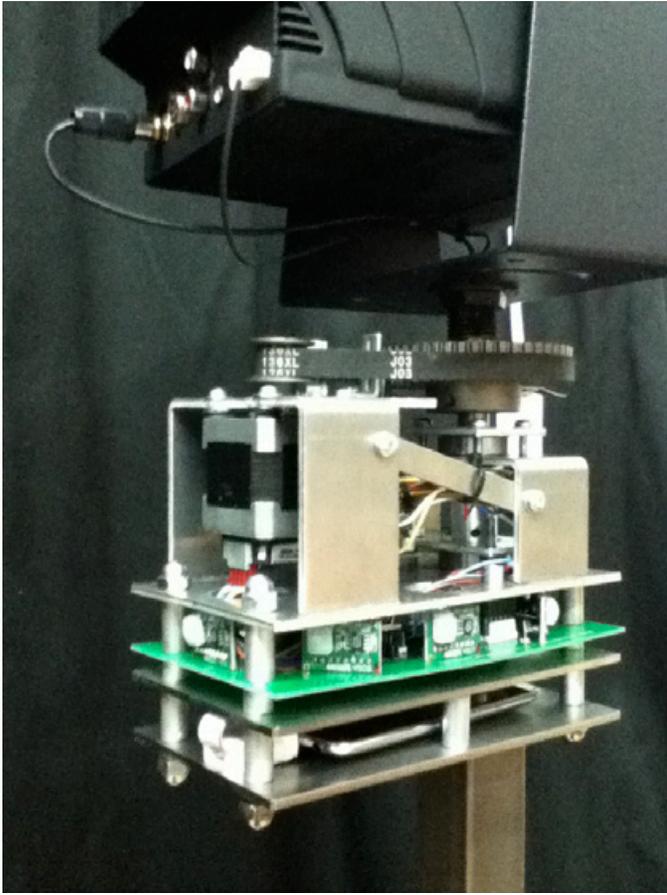
Low profile female header, Samtec Inc, SLW-150-01-S-S

iPod Connector Male Style 1

Polarizing connectors, Tyco Electronics, MTA-100 Series

Phono (RCA) plug, CUI Inc, RCP-011

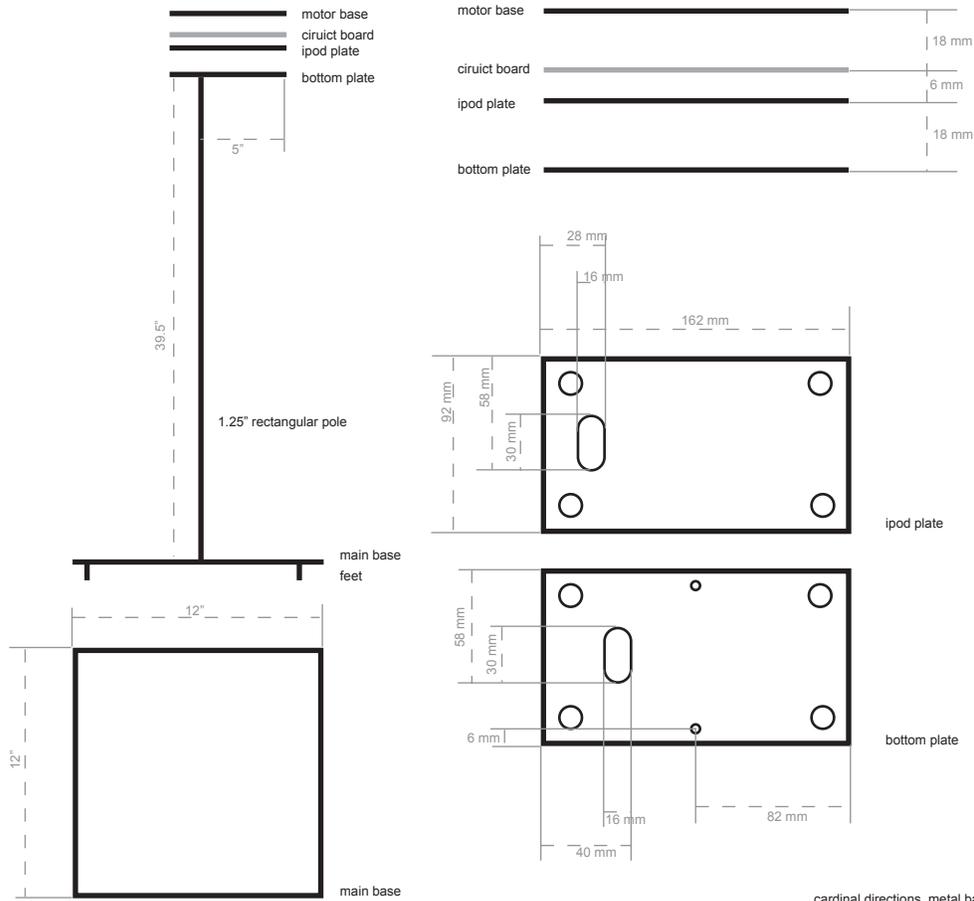
Securing the iPod Touch



The iPod should be placed in the bottom compartment as shown in the images above. You will need to remove one of the two middle set screws. This will allow you to slide the iPod in place.

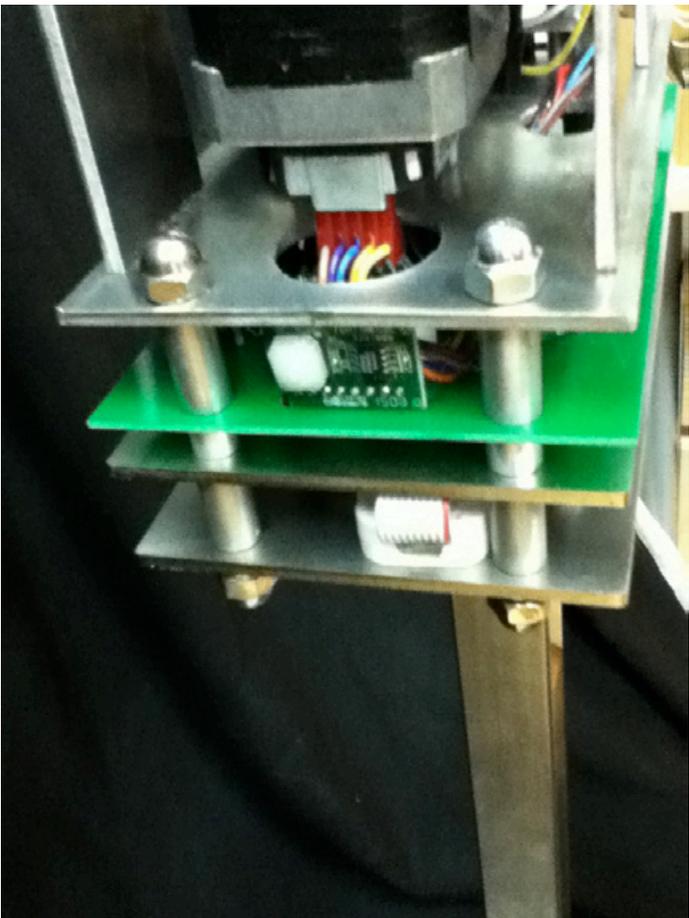
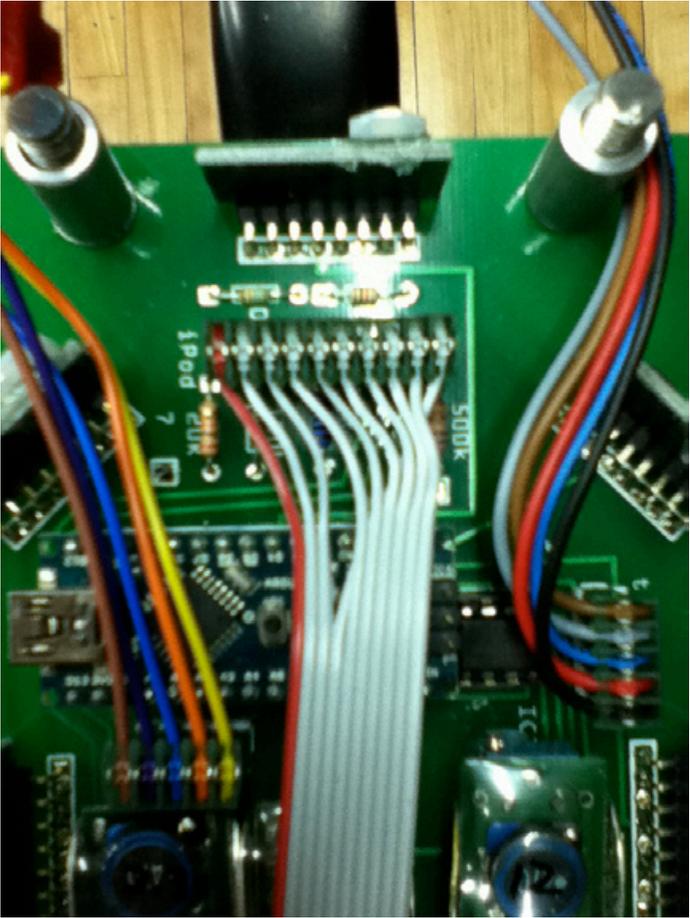
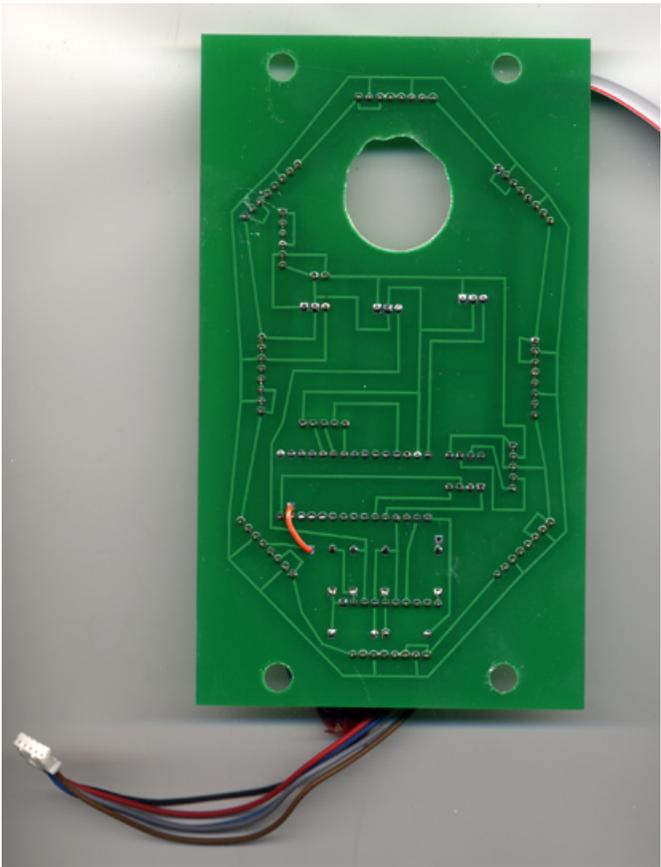
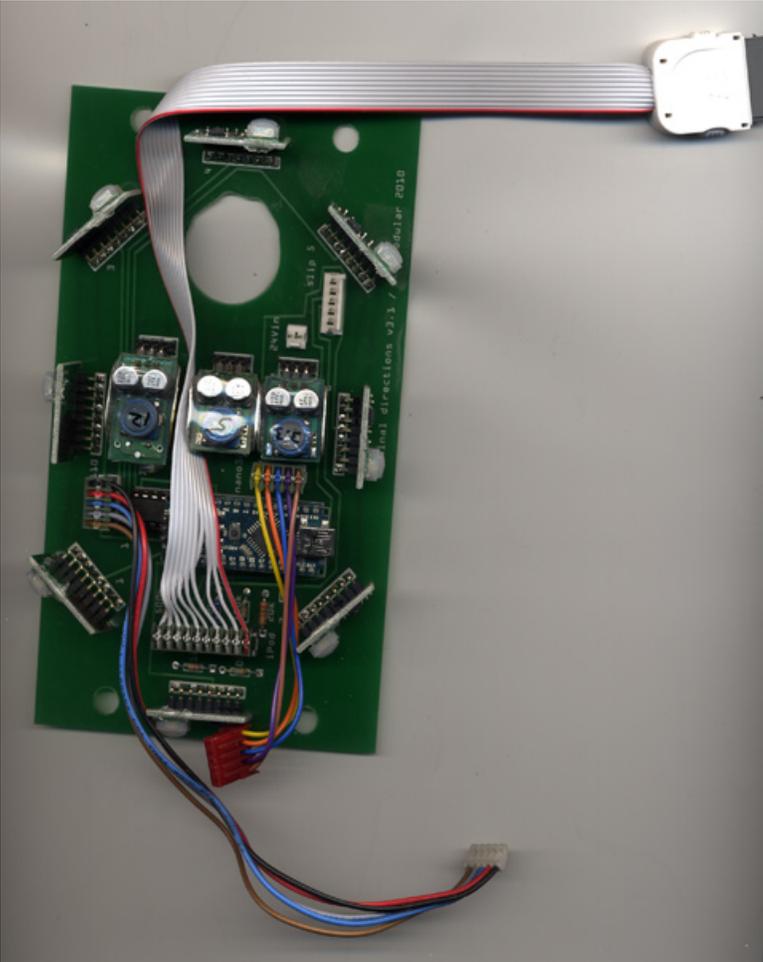
Once the set screw and aluminium bushing are back in place the iPod is secure and cannot slide out.

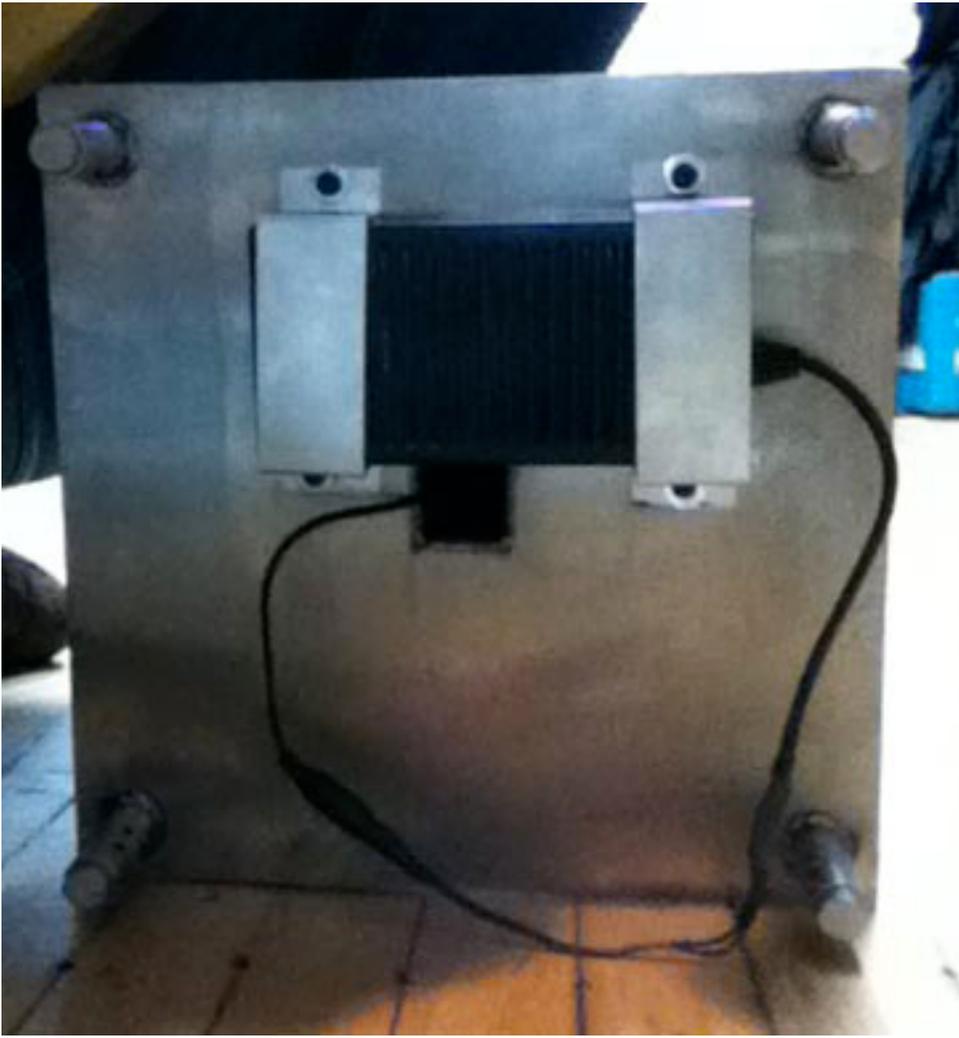
Metal Base



cardinal directions, metal base

Circuit board and cabling

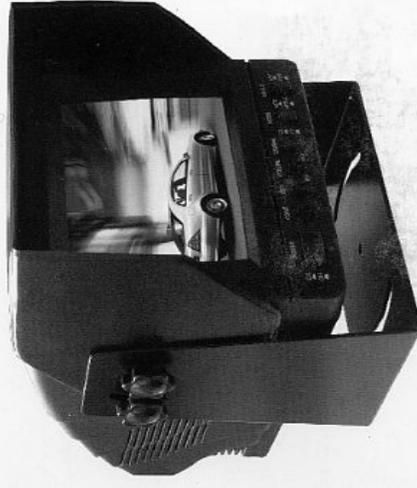




Appendix II

Car Rear Viewer

Operating Instruction



Please read this manual completely before operating the unit

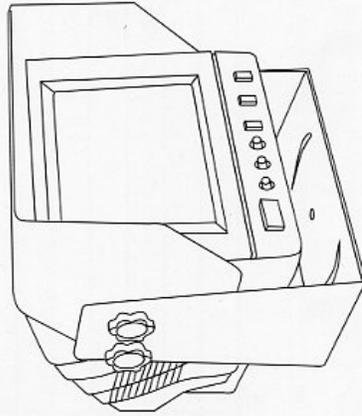
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PREFACE

Thanks for your purchasing of

5.5-Inch Car Rear Viewer



System Features

- 5.5" Military-type Phosphor Cathode Ray Tube(CRT)
- Wide voltage input adaptability: 11~32V DC
- 2 channels of audio/video input, 1 channel of audio/video composite output
- Power/Stand-by mode option
- Normal/Mirror image switch
- Day/Night lightness option
- Near Sunlight-readability
- Double-sided PCB board for efficiently increasing anti-vibration ability (6.8G)
- Contrast, brightness and volume adjustment
- Built-in speaker
- Adjustable Mounting Bracket
- Sun shield included

SYSTEM COMPOSITION

Before using the product, please make sure that the package of product includes the following items.

Item	Quantity
Monitor	1
Monitor support	1
Support mounting screw	4
Power cable	1
Anti-vibration pad	1
Angle adjustment screw	4
System connecting cable	1
Direction indication film	1
Sun shield	1
Operating instruction	1

Accessories

	
Monitor support	Angle adjustment screw
	
Power cable	Support mounting screw
	
Sun shield	Direction indication film
	
System connecting cable	Anti-vibration pad

SYSTEM INSTALLATION GUIDE

This monitor can be mounted by embedding to the dash area, hanging from the truck roof or seating to any position which is suitable to the driver to observe the images.

Mounting monitor

1. Select a position to mount the monitor
2. Well position the monitor support, mark the fixing hole position and drill fixing holes
3. See Fig.1, put spring lockwasher on mounting screw to fix the monitor support
4. See Fig.2, fix the monitor to the support with 4 angle adjustment screws
5. See Fig.3, connect cables according to port connection diagram

Connecting power cable

6. See Fig.4, Connect one end of the power cable(wire) to the right position on the dashboard
7. connect the other end of the power cable(plug) to the monitor

System connecting

8. See Fig.4, connect the monitor and the camera with the system connecting cable.
You can link the monitor with at most 2 channels of cameras and 1 channel of video/audio output
(AV signal cable can be selective purchase)

WARNING

Electrical shock or fire hazard. Do not try to service this unit yourself. Service should be handled by qualified technicians.

MONITOR MOUNTING

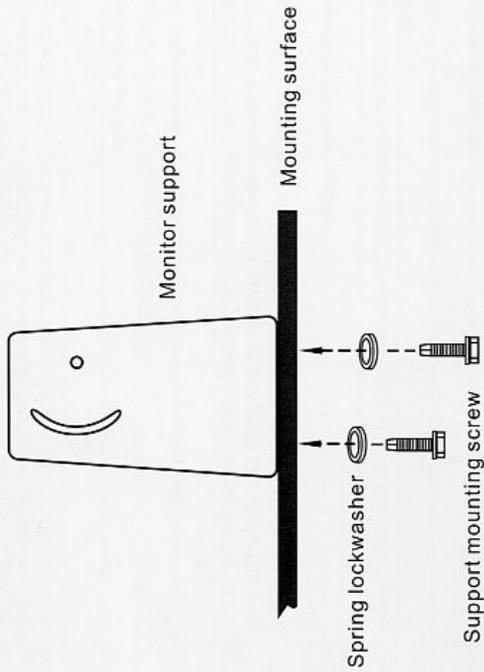


Fig.1 Mounting the support

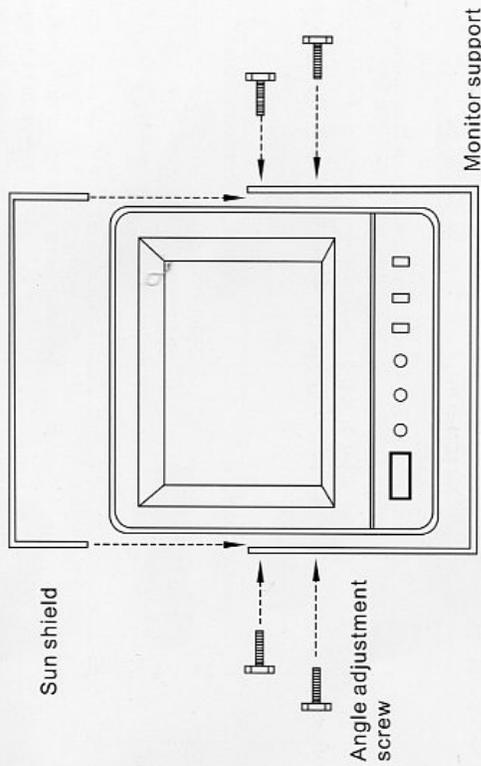


Fig.2 Fixing the monitor

PORT CONNECTION DISPLAY

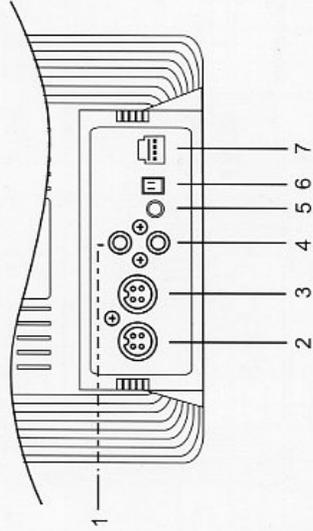
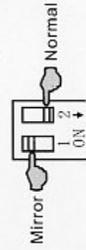
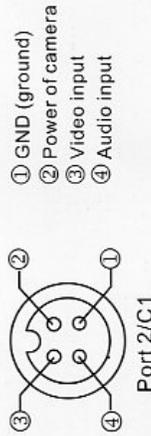


Fig. 3 Port connection

1. Video output
2. Camera1 input
3. Camera2 input
4. Audio output
5. To exterior speaker
6. Normal/Mirror image switch

Detail of ports



Turn the switch from up to down can switch the image display from mirror to normal.



SYSTEM CONNECTION DISPLAY

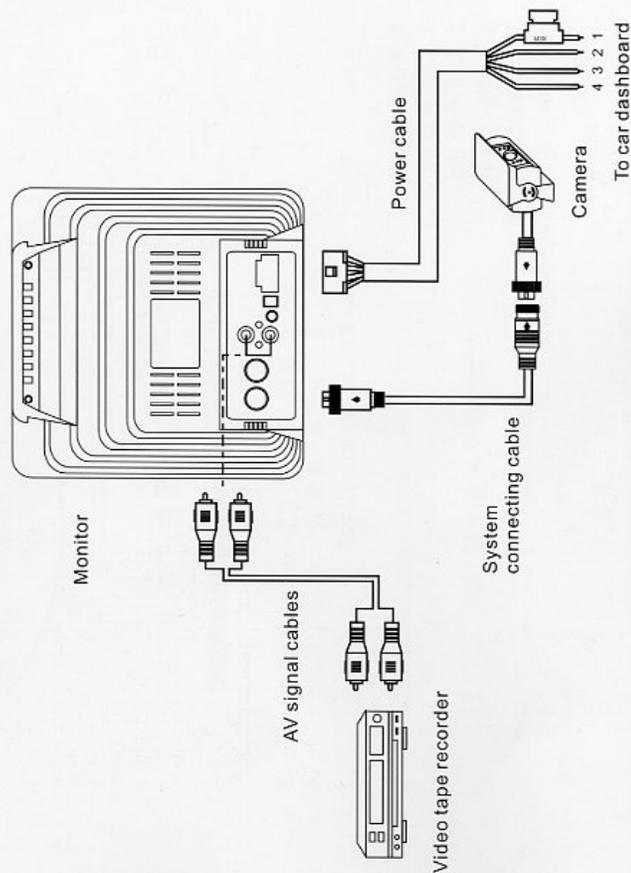


Fig.4 System connection

Power cable connection

1. Red to DC12V power input
2. Brown to reversing control power
3. White to postern control power
4. Black to ground(GND)

This product can be linked to 2 channels of cameras and 1 channel of video output which connect to a video tape recorder for recording images.

IDENTIFYING THE PARTS

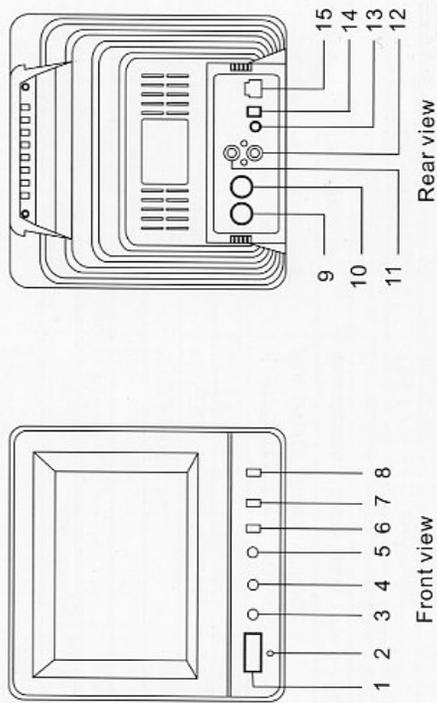


Fig.5 Front and rear view of product

1. Power switch
2. Power indicator
3. Contrast adjustment
4. Brightness adjustment
5. Volume adjustment
6. Camera1 switch
7. Camera2 switch
8. Day/Night lightness option
9. Camera input C1
10. Camera input C2
11. Video output
12. Audio output
13. To exterior speaker
14. Normal/Mirror image switch
15. Power input

TECHNICAL SPECIFICATIONS

The technical specification of monitor is listed below

Serial Number	Item	Specifications
1	Display device	5.5" CRT
2	Deflection angle	70°
3	Input voltage	11~32V(DC)
4	Output voltage	10V(DC)
5	Power consumption	Max. 1A
6	Scanning frequency	CCIR: (H)15625Hz/ (V) 50Hz EIA: (H)15750Hz/ (V) 60Hz
7	Video input	Composite video signal 1Vp-p 75Ohm
8	Video output	Composite video signal 1Vp-p 75Ohm
9	Horizontal resolution	420 TV lines at maximum
10	Field resolution	420 TV lines at maximum
11	Anti-vibration capability	6.8G
12	Camera port	4-pin DIN socket
13	AV port	RCA socket
14	Storage temperature	-25° C~+70° C
15	Operating temperature	-0° C~+60° C
16	Dimensions	160(W)x147(H)x143(L)mm (without support and sun shield)
17	Parking dimensions	293(W)x268(H)x200(L)mm

NOTICE

The manufacturer reserves the right to change the specifications without notice.

TROUBLESHOOTING

Solve problems according to the table below

Symptom	Cause	Solution
Rolling image	Monitor(horizontal control)	Replace monitor
Shrunk & Unstable image	Monitor improper voltage	check the voltage of power supply
Black image	Monitor improper voltage	if ok, check fuse->check power cable, wires or connector(loose or broken?) If all above item are ok, replace monitor
White image	Monitor/Camera	Check main system cable. Make sure all connectors are connected properly. If ok, check 4 pin DIN monitor cable. If ok, replace camera
Blurred image	Fog, mud, water or ice on camera lens or porthole moisture in camera	Clean camera porthole. If condensation or moisture is visible inside camera, initiate device immediately.
Engine noise or Static lines	Monitor	Make sure ground and +12V DC source is in solid connection. Call tech-support for assistance
No light displayed on monitor	Broken fuse or low brightness level	Check whether the fuse is broken or brightness adjustment has been turned to the lowest level
No image	Improper plugging in connector or broken system connecting cable	plug the connector properly or replace the system connecting cable

If you still can not solve the problems, contact our tech-support engineer for assistance.

WARNING

Electrical shock or fire hazard. Do not try to service this unit yourself. Service should be handled by qualified technicians.

Appendix III

Appendix VI

Installations shots



